

DESCRIPTION OF THE LARVA OF PLEOCOMA  
HIRTICOLLIS VANDYKEI LINSLEY  
(Coleoptera, Scarabaeidae)<sup>1</sup>

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Much has been written about the adults of the peculiar genus *Pleocomma* and their habits, but little has been published about their larval stage. Osten-Sacken in 1874 described a *Pleocomma* larva found deep in the earth by Mr. Behrens of San Francisco. The only other reference to the morphology of larvae of the genus is by Böving and Craighead (1930-31) in their key to families and subfamilies of the Scarabaeoidea.

Early in 1946, while visiting at the University of California, in Berkeley, the writer was shown 8 *Pleocomma* larvae collected February 26 by R. F. Smith and J. W. MacSwain from a spot near Patterson Pass where *Pleocomma hirticollis vandykei* Linsley had been found abundant previously (Smith and Potts, 1945). A second trip to the same spot, March 8, 1946, by Smith, MacSwain, several of Linsley's graduate students, and the writer, yielded over 40 additional larvae. They were found from 1 to 3 inches deep in the pasture soil feeding on grass roots.

Besides the larva of *Pleocomma hirticollis vandykei* Linsley, described in this paper, the larvae of *Pleocomma australis* Fall, *Pleocomma badia* Fall, *Pleocomma fimbriata* Le Conte and a larva of an unknown species from Sacramento, California, have been examined by the writer, through the courtesy of Dr. Linsley and the U. S. National Museum. All of these agree in the following essential characters: antenna 3-segmented; epipharynx with tormae not united mesally; haptomerum with a group of heli; chaetoparia well-developed; plegmatia present; hypopharynx without oncyli; terga of abdominal segments 3 to 7, inclusive, with 4 dorsal annulets; spiracles with concavities of respiratory plates facing ventrally; legs 4-segmented; mesothoracic and meta-thoracic legs with stridulating organs; anal opening Y-shaped, not surrounded by fleshy lobes.

<sup>1</sup>The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the Director.

Like the adults, *Pleocoma* larvae resemble geotrupids in several important morphological features. Of all the Scarabaeidae, only larvae of *Pleocoma* and those of geotrupids have 3-segmented antennae. Too, the stridulating organs found on the legs of *Pleocoma* larvae are very similar to those of *Geotrupes* and *Odontaeus*. In contrast, however, the epipharynx, the tergal annulets of the abdominal segments, and the last abdominal segment of *Pleocoma* are entirely different from homologous structures of known geotrupid larvae and, in fact, resemble in many ways structures characteristic of melolonthine larvae. Because of these important differences, the writer would prefer placing the genus *Pleocoma* in a subfamily close to, but distinct from, the Geotrupinae, as Leng (1920) has done, rather than class *Pleocoma* with the geotrupids (Paulian, 1941).

#### THIRD-STAGE LARVA OF *PLEOCOMA HIRTICOLLIS VANDYKEI* LINSLEY

Description based upon a study of 9 third-stage larvae and a cast skin of a larva found associated with a dead male in its pupal cell. Male identified by Linsley.

*Larva* (Fig. 1) typically scarabaeiform with whitish body and light yellow-brown head. Length of mature larva ranging from about 45 to 50 mm.

*Cranium* (Fig. 4) narrower than prothorax. Surface shining and generally smooth with a series of fine longitudinal striae on each side of the epicranial suture (ES). Maximum width of cranium ranging from 6.5 to 9 mm. with a mean of 8 mm. Frontal sutures (FS) whitish and sinuate, forming less than a right angle at their juncture with the epicranial suture. Frons (F) bearing on each side an irregular, transverse row of 5 to 10 posterior frontal setae (PFS), one large seta (AA) in each anterior angle (rarely with an additional small seta), a single large exterior frontal seta (EFS) (often with 1 or 2 small setae), and a single large anterior frontal seta (AF) (plus 2 to 4 small setae). Epicranium (E) with 2 large dorsoepicranial setae on each side of the epicranial suture. Ocelli absent.

*Clypeus* (Fig. 4) trapezoidal with slightly concave lateral margins; divided transversely into a large, rather heavily sclerotized postclypeus (PSC) and a very small, membranous pre-clypeus (PC). Postclypeus on each side with a transverse patch

of setae consisting of 3 large setae and several small setae, anteriorly with an irregular series of low longitudinal rugosities.

*Labrum* (L, Fig. 4) slightly wider than long, symmetrical and apically trilobed. Surface bearing numerous long setae and, except for the apical membraneous lobes, rather heavily sclerotized and coarsely reticulate.

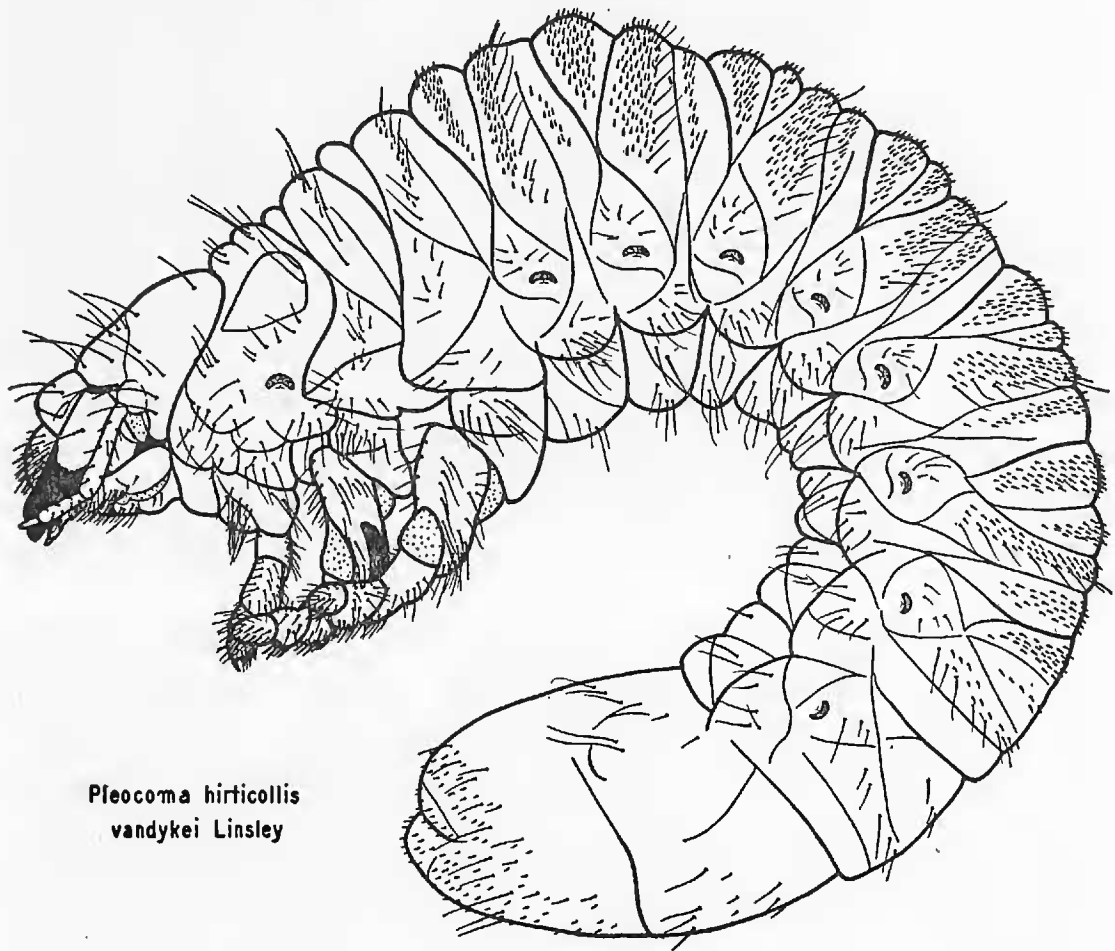


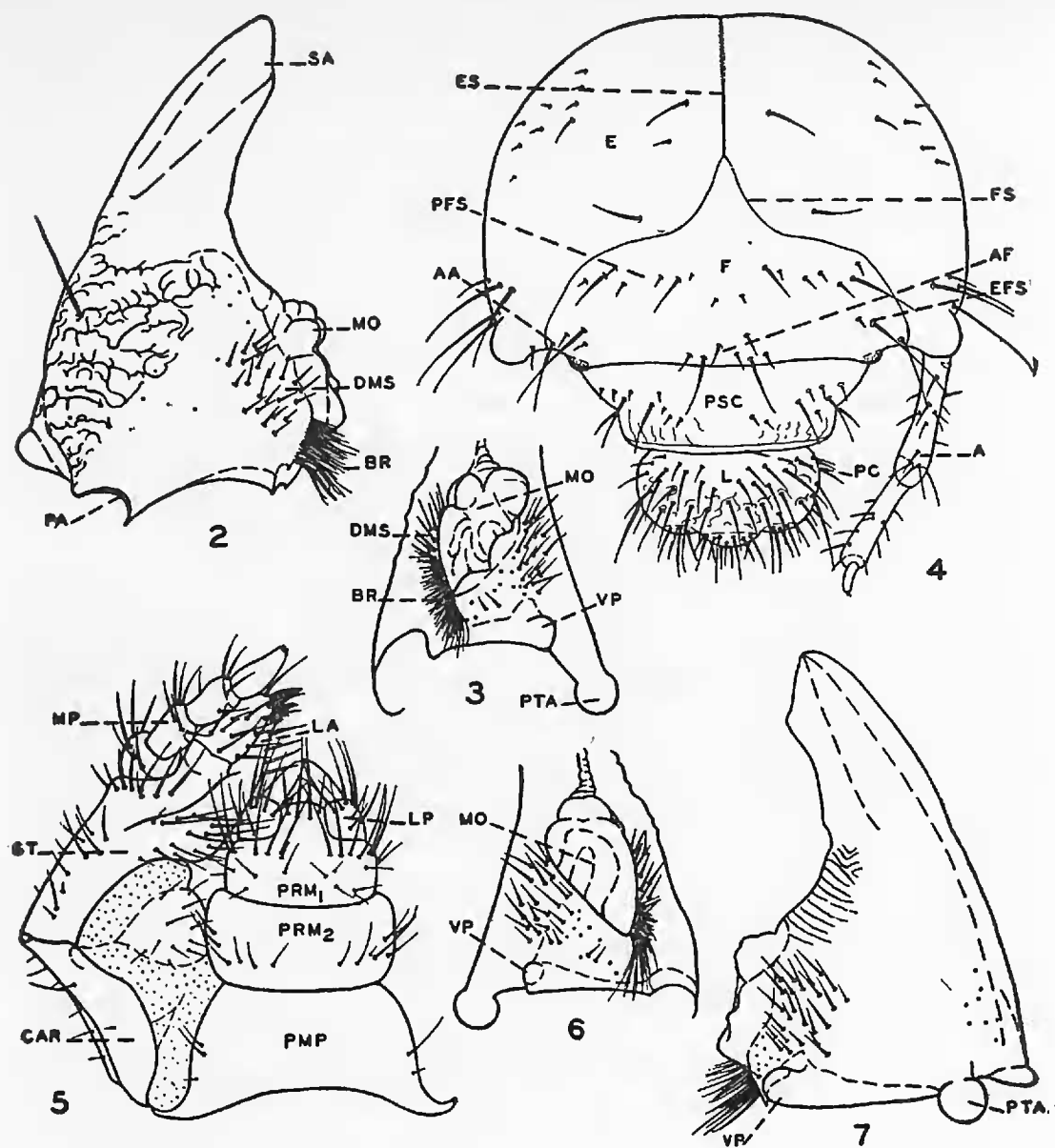
Fig. 1. Third-stage larva of *Pleocoma hirticollis vandykei* Linsley. Left lateral view. 10X.

*Antenna* (A, Fig. 4) almost as long as cranium, fairly slender, 3-jointed, and borne on a cylindrical basal piece fused to the epicranium. First segment as long as second and third segments together; third segment very small, about one-third as long and half as wide as second segment. First and second segments bearing numerous setae. End of second antennal segment, below juncture with apical segment, with a small oval sensory spot. Apical segment without sensory spots; apex with 2 to 4 olfactory pegs.

*Mandibles* (Figs. 2, 3, 6 and 7) shorter than cranium, approximately symmetrical, subtriangular in outline, each with a strong, blade-like scissorial area (SA) and a rather small, molar area (MO). Scissorial area blackish with a slightly concave or nearly straight cutting edge. Molar areas also blackish, those of left and right mandibles similar in size but somewhat asymmetrical. Molar area of right mandible (Fig. 6) with a transverse apical lobe and a curved median lobe, the latter surrounding a small, longitudinal proximal lobe. At the base of each molar area is a dense brush of setae or brustia (BR). On the dorsal surface of each mandible, laterad of each molar area, is a patch of 27 to 30 setae, the dorsomolar setae (DMS). Dorso-exterior mandibular region and lateral face of mandible much wrinkled, not separated by a scrobis. Lateral face with a single, large, median seta. Ventral surface of each mandible transversely wrinkled between the inner proximal part of the scissorial area and the molar area. Laterad of the molar area and extending to the vicinity of the small ventral mandibular process (VP) is a large patch of 29 to 33 setae. The region mesad of the ventral mandibular process bears a number of pores and sometimes 1 to 3 setae.

*Maxilla* (Figs. 5 and 8) consisting of a cardo, stipes, galea, lacinia and a maxillary palpus. Cardo (CAR) subquadrate in outline and extending from the base of the maxilla to the proximal edge of the stipes. Cardo divided longitudinally into 2 oblong sclerites, the dorsal one bearing a few scattered setae. Stipes (ST) bounded posteriorly by the cardo and anteriorly by the maxillary palpus and galea. Dorsally, along the inner edge of the stipes, is a row of 10 to 16 conical, stridulating teeth (SD). Ventrally, the stipes bears a number of long needle-like setae; and a narrow, transverse, irregular double row of similar setae adjoins the maxillary palpus. Galea and lacinia distinctly separate but lying close together. Galea (G) with a single apical uncus (UN), bordered dorsally by 4 stout setae and ventrally by 2 stout setae; remainder of surface with a sparse covering of slender setae. Lacinia (LA), with a terminal uncus having 1 or 2 ventral tooth-like lobes. Inner edge of lacinia bearing 2 rows of long stout setae, the dorsal row extending from the uncus to the proximal margin of the lacinia. Dorsad and ventrad of the rows of stout seta the lacinia is sparsely covered with slender setae. Maxillary palpus 4-jointed, the first 3 joints bordered an-





PLEOCOMA HIRTICOLLIS VANDYKEI LINSLEY

Fig. 2. Left mandible, dorsal view. Fig. 3. Molar region of left mandible, ental view. Fig. 4. Head, cephalic view. Fig. 5. Right maxilla and labrum, ventral view. Fig. 6. Molar region of right mandible, ental view. Fig. 7. Left mandible, ventral view.

Abbreviations: A—Antenna. AA—Seta of anterior frontal angle. AF—Anterior frontal setae. BR—Brustia. CAR—Cardo. DMS—Dorsomolar setae. E—Epicranium. EFS—Exterior frontal setae. ES—Epicranial suture. F—Frons. FS—Frontal suture. L—Labrum. LA—Lacinia. LP—Labial palpus. MO—Molar area. MP—Maxillary palpus. PA—Preartis. PC—Preclypeus. PFS—Posterior frontal setae. PMP—Postmentum. PRM—Prementum. PSC—Postclypeus. PTA—Postartis. SA—Scissorial area. ST—Stipes. VP—Ventral process.

teriorly by a semi-circle of setae. Apical joint with a lateral, sensorial groove and a number of distal, sensory pegs.

*Labium* (Figs. 5 and 9) composed ventrally of a subtrapezoidal postmentum (PMP), the subdivided prementum (PRM<sub>1</sub> and PRM<sub>2</sub>) and a pair of labial palpi (LP). Postmentum bare except for a few setae near each lateral margin. Proximal sclerite of prementum subquadrate in outline, wider than long, set with a transverse row of setae interrupted mesally. Apical sclerite of prementum set with numerous setae, of which the largest are those adjacent to the bases of the labial palpi. Dorsal surface of apical sclerite of prementum, called the glossa (GL), with a dense covering of long slender setae, anteriorly and on each side. Central posterior portion of glossa sparsely set with short, stout, conical setae. Labial palpi 2-segmented.

*Hypopharynx* Fig. 9, (HP) located posterior to the glossa and dorsad of the proximal sclerite of the prementum. Hypopharynx, on each side with a caudal sclerotized shoulder (LL) behind which is the point of contact with the ventral process of the adjacent mandible. Oncyli (the protruding, sclerotized hypopharyngeal process or processes present in most scarab larvae) absent.

*Epipharynx* (Fig. 12) symmetrical, slightly broader than long with rounded lateral margins, trilobed apically. Apical lobe, or corypha (CO), set with coarse setae and bounded on each side by a clithrum (CLI). Plegmatia present, each plegmatium (PL) consisting of about 11 to 15 semi-circular, sclerotized plegmata, each plegma surrounding the base of a coarse acanthoparial seta. Proplegmatia absent. Chaetoparia (CPA) large, separated from the acanthoparia by a narrow gymnoparia (GP). Each chaetoparia consisting of a dense patch of sharp setae not interspersed with sensilla. Chaeta stoutest toward the pedium (PE). Hapto-merum (H) bearing a rather sparsely set, semi-circular group of 9 to 12 large, stout heli (HE). Anterior to the bases of most of the heli is a single large sensillum. Tormae rather indistinct, symmetrical, not branched, not meeting mesally. Haptolachus (HL) incomplete, nesia absent. Caudomesad of the inner end of the dextortorma (DX) and the pternotorma (PTT) is a longitudinal curved phoba (PH). The area laterad of each phoba has 20 to 30 crepidial punctures CP). Four macrosensilla (MS) are found between the caudal ends of the phobae. Posterior to the phobae is the curved, transverse crepis (CR).

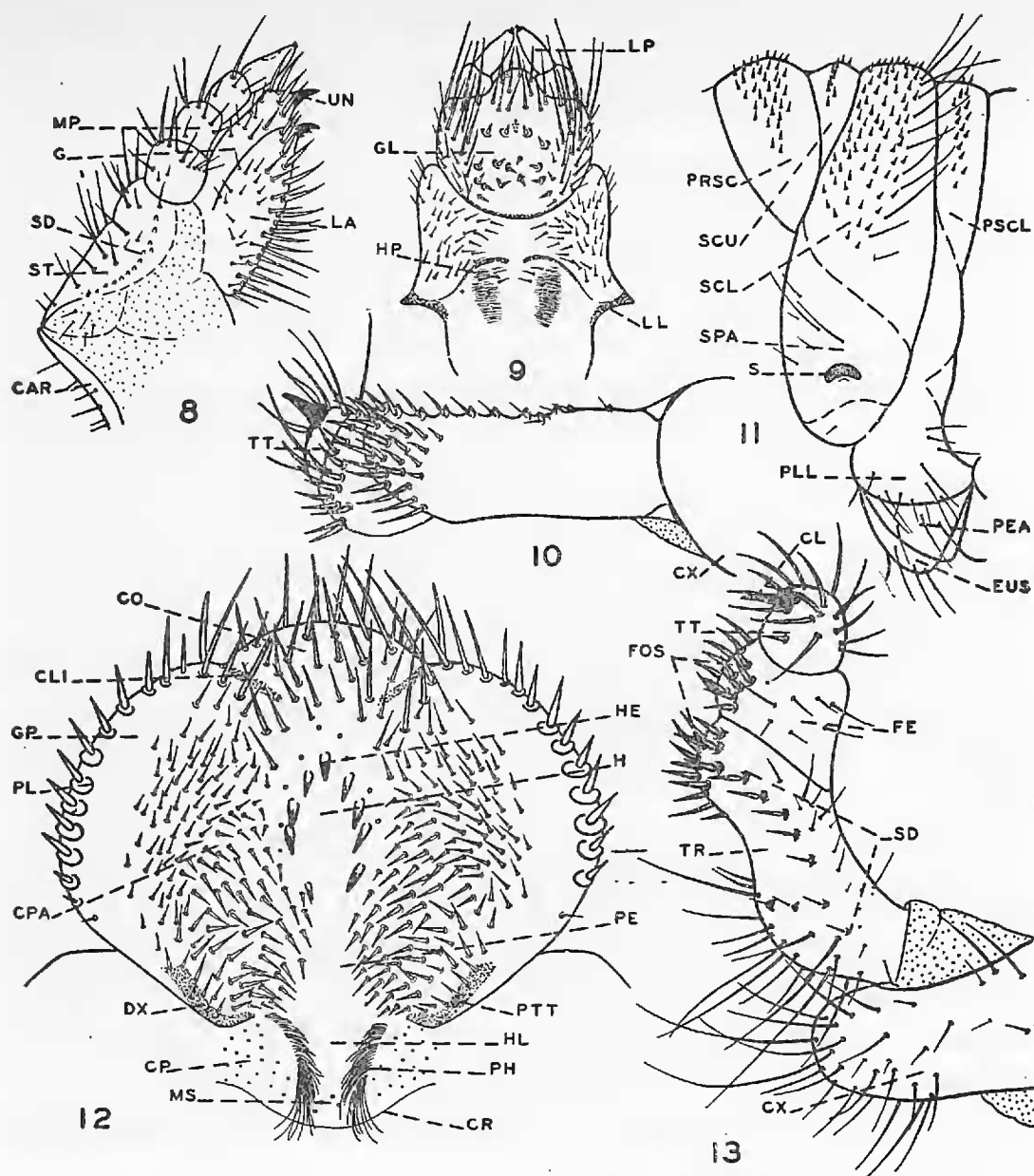


Fig. 8. Left maxilla, dorsal view. Fig. 9. Labium and hypopharynx, dorsal view. Fig. 10. Distal portion of right, metathoracic leg, ventral view. Fig. 11. Third abdominal segment, left lateral view. Fig. 12. Epipharynx. Fig. 13. Right metathoracic leg, lateral view.

Abbreviations: CAR—Cardo. CL—Claw. CLI—Clithrum. CO—Corpyha. CP—Crepidial punctures. CPA—Chaetoparia. CR—Crepis. CX—Coxa. DX—Dexiotorma. EUS—Eusternum. FE—Femur. FOS—Fossorial setae. G—Galea. GL—Glossa. GP—Gymnoparia. H—Haptomerum. HE—Helus. HL—Haptolachus. HP—Hypopharynx. LA—Lacinia. LL—Lateral lobe. LP—Labial palpus. MP—Maxillary palpus. MS—Macrosensilla. PE—Pedium. PEA—Pedal area. Ph—Phoba. PL—Plegma. PLL—Pleural lobe. PRSC—Prescutum. PSCL—Postscutellum. PTT—Pternotorma. S—Spiracle. SCL—Scutellum. SCU—Scutum. SD—Stridulating teeth. SPA—Spiracular area. ST—Stipes. TR—Trochanter. TT—Tibiotarsus. UN—Uncus.



*Legs* (Figs. 1, 10 and 13) well developed with the prothoracic shorter than the mesothoracic pair and the mesothoracic shorter than the metathoracic pair. Each leg 4-jointed, consisting of a fairly long, stout subcylindrical coxa (CX), a slightly shorter trochanter (TR), a short femur (FE) and a short tibiotarsus (TT) which bears a terminal claw (CL). Mesothoracic and metathoracic legs with stridulating organs, these consisting of a finely striated area on the posterior surface of the mesothoracic coxa and a V-shaped row of about 12 sclerotized teeth (SD), each tooth at the base of a seta, on the anterior surface of the metathoracic trochanter. Anterior ventral surface of meso- and metathoracic trochanters and ventral surface of meso- and metathoracic femora densely set with stout spine-like setae (FOS, Fig. 13) undoubtedly useful in burrowing through the hard soil. Claws simple, each consisting of a straw-colored base and a dark, slender, sharp, distal portion. Base of each claw with 2 setae. Prothoracic claws much longer than meso- and metathoracic claws.

*Body* (Fig. 1) consisting of 3 thoracic and 10 abdominal segments. Prothorax with 2 dorsal areas each with a single transverse row of slender setae. Mesothorax and metathorax each with 3 dorsal annulets, a prescutum, a scutum, and a scutellum. Scutum of mesothorax with a transverse row of slender setae; scutum of metathorax similarly clothed and, in addition, with an irregular, transverse, single or double row of short stout setae cephalad of the slender setae.

First and second abdominal segments each with 3 dorsal areas. Prescuta of each with a transverse band of short stout setae; that on the first abdominal segment 2 or 3 rows wide, that on second abdominal segment about 5 or 6 rows wide. Scuta each with a long transverse band of setae consisting anteriorly of about 5 irregular rows of short stout setae and posteriorly of a single sparsely set row of fairly long slender setae. Scutellum of first abdominal segment with a short sparsely set transverse patch of short, stout setae on each side and a bare, middorsal area. Scutellum of second abdominal segment with a long, narrow, transverse, single or double row of short, stout setae. Abdominal segments 3 (Fig. 11) to 7 inclusive each with 4 dorsal annulets, a prescutum, scutum, scutellum and postscutellum. Each prescutum bears a transverse patch of about 5 to 7 irregular rows of short, stout setae. Each scutum with a short, transverse, irregular, double



row of short, stout setae. Each scutellum has a long transverse band of short, stout setae posterior to which is a single sparsely set row of rather long slender setae. Each postscutellum (except that of abdominal segment 7 which is bare) with a long, transverse, irregular double or triple row of short, stout setae.

Dorsa of abdominal segments 8 and 9 not divided into distinct annulets. Each dorsum anteriorly with scattered slender setae and an occasional short, stout setae; posteriorly with a sparsely-set transverse row of long slender setae cephalad of which are a few scattered, short, stout setae. Dorsum of tenth abdominal segment with a transverse sinuate dorsal impressed line. Region

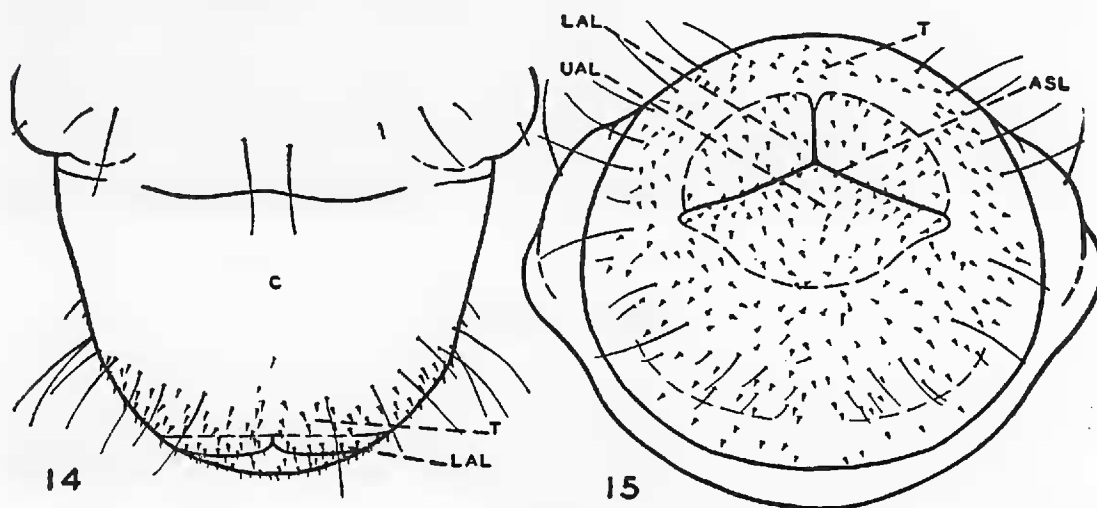


Fig. 14. Last abdominal segment, ventral view. Fig. 15. Last abdominal segment, caudal view.

Abbreviations. ASL—Anal slit. C—Campus. LAL—Lower anal lip. T—Teges. UAL—Upper anal lip.

between dorsal impressed line and anterior margin of abdominal segment 10 set with scattered short, stout setae. Dorsal area between upper anal lip (UAL, Fig. 15) and dorsal impressed line clothed with short, stout setae interspersed with long, slender setae.

Thoracic shield, located on each side of prothorax, rather inconspicuous, straw-colored, roughly triangular in outline. Spiracle-bearing areas (SPA, Fig. 11) of abdominal segments 1 to 8 each with 5 to 9 setae. Pleural lobes (PLL) of abdominal segments 1 to 8 each with a patch of 8 to 16 setae. Eusterna (EUS) of abdominal segments 1 to 7 each with a transverse row of 6 to 16 setae. Pedal areas (PEA) of same segments with 2 to 7 setae on each side.

*Anal Slit* (ASL, Fig. 15) Y-shaped, basal cleft short. Anus bordered dorsally by the triangular upper anal lip (UAL) and ventrally by the mesally cleft lower anal lip (LAL). Both anal lips covered with short, stout setae.

*Raster* (Figs. 14 and 15) consisting of a simple teges (T) in the form of a narrow transverse band of 50 to 70 short, stout, caudally directed setae, located cephalad of the lower anal lip. Cephalad of the teges, especially toward each side, are several long, slender setae. Anterior to these setae and the teges, the venter of the tenth abdominal segment is bare (C, Fig. 14).

*Spiracles* (Figs. 1 and 11) consisting of 1 pair of thoracic spiracles and 8 pairs of abdominal spiracles. Thoracic spiracles considerably larger than the abdominal spiracles which are alike in size. Respiratory plates of spiracles kidney-shaped, with their concavities facing ventrally. Spiracles cribiform but "holes" of respiratory plate rather opaque, not arranged in definite rows.

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